Nature Conservation 13: 1–19 (2015)
doi: 10.3897/natureconservation.13.5625
http://natureconservation.pensoft.net

RESEARCH ARTICLE

A peer-reviewed open-access journal
Nature Conservation
Launched to accelerate biodiversity conservation

A star attraction: The illegal trade in Indian Star Tortoises

Neil D'Cruze[1,2], Bhagat Singh[2], Thomas Morrison[2], Jan Schmidt-Burbach[2], David W. Macdonald[1], Aniruddha Mookerjee[2]

1 *The Wildlife Conservation Research Unit2, Department of Zoology, University of Oxford, The Recanati-Kaplan Centre, Tubney House, Abingdon Road, Tubney, OX13 5QL, UK* **2** *World Animal Protection1, 222 Grays Inn Road, 5th Floor, London, WC1X 8HB, UK*

Corresponding author: *Neil D'Cruze* (neil.dcruze@zoo.ox.ac.uk)

Academic editor: *Klaus Henle* | Received 9 July 2014 | Accepted 4 November 2015 | Published 9 November 2015

http://zoobank.org/A1DBC4BB-7FE1-4C65-BFEF-C960B9B29655

Citation: D'Cruze N, Singh B, Morrison T, Schmidt-Burbach J, Macdonald DW, Mookerjee A (2015) A star attraction: The illegal trade in Indian Star Tortoises. Nature Conservation 13: 1–19. doi: 10.3897/natureconservation.13.5625

Abstract

We report on illegal international trade in Indian Star Tortoises (*Geochelone elegans*), with a particular focus on India and Thailand.Within India, this species has received protection as a Schedule IV list species of the Wildlife (Protection) Act 1972 for over 40 years. This study documents the illegal trade of 55,000 individuals poached from just one 'trade hub' in India. Although domestic demand persists, these individuals appear to have been primarily sourced to satiate international demand for pets in other Asian countries (e.g. Thailand and China). Since 1975, this species has been included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) that regulates all commercial trade. However, an analysis of the CITES trade records relating to Thailand imports (between 2004 and 2013) found large discrepancies indicating potential illegal activity which question the legitimacy of its founding captive stock. Given its role as a major hub of illegal trade activity, both as a consumer and a country of transit, we support calls for Thailand to prohibit private ownership by extending its domestic legislation to also cover non-indigenous tortoise species. In consideration of conservation and animal welfare concerns, we also call for more field research to determine the impacts of illegal trade on wild populations, an updated assessment of its conservation status, increased cooperation between national enforcement agencies, and the implementation of targeted human behaviour change initiatives to help reduce consumer demand for this species.

Keywords

CITES, exotic pet, *Geochelone elegans*, illegal wildlife trade, India, Thailand

Copyright *Neil D'Cruze et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

The illegal trade in wildlife is a big and burgeoning business, with global profits estimated to be worth between $8 – $10 billion US dollars each year (Lawson and Vines 2014). It can have severe negative impacts on wild populations, leading to biodiversity loss, the introduction of invasive species, and disease (Bush et al. 2014). This unregulated activity also represents a particularly severe threat to wild animal welfare during illegal capture, transport, sale and subsequent use (Baker et al. 2013). Increased understanding of the links with other types of criminal activity, including drug trafficking, organized crime, and terrorism is also highlighting how illegal wildlife trade threatens the stability and security of the societies involved (Lawson and Vines 2014).

A substantial component of illegal wildlife trade comprises reptiles and their derivatives or products (Nijman et al. 2012). A recent global analysis of reptile trade indicates an apparent shift away from illegally wild-caught to legal captive-bred sources over recent decades (Robinson et al. 2015). However, despite this trend, INTERPOL seized thousands of live reptiles and products worth more than 28 million US dollars following a global reptile enforcement operation 'RAMP' in 2010 (INTERPOL 2010). More recently, 10% of the 799 international seizure records reported by EU Member States in 2012 involved reptiles (TRAFFIC 2013). Some reptile groups (particularly freshwater turtles and tortoises) are facing disproportionately high extractions and therefore proportionately high extinction risks, with consumer demand for use as food, curios, ceremonies, and pets being a major threat to their survival (Robinson et al. 2015).

The illegal trade in Testudines is arguably nowhere more prevalent than in Southeast Asia (Nijman and Shepherd 2015). Increasing affluence across this region is thought to be stimulating illegal activity (Nijman and Shepherd 2010), leading to steep declines in populations of a large number of species (Nijman and Shepherd 2015). Thailand has long been known as a major hub of this trade (e.g. van Dijk and Palasuwan 2000) where large numbers of many species, both native and non-native, are illegally acquired and traded globally as pets (Chng 2014). For example, a recent study focused on Thai enforcement activity revealed that a total of 18,854 freshwater turtles and tortoises were seized in 53 cases reported between 2008 and 2013 alone (Chng 2014).

Of ongoing and increasing concern from an international illegal wildlife trade perspective (Shepherd et al 2004, IUCN SSN TTSG 2010, Horne et al 2012, UNEP-WCMC 2014), the Indian Star Tortoise (*Geochelone elegans*) is a relatively small and adaptable terrestrial species primarily found in scrub forests, grasslands, and some coastal scrublands of arid and semi-arid regions throughout its wide range (Das 2002). Nesting seasons coincide with the monsoons that vary depending on the geographic location (e.g. (May to June in western India) (March to June and October to January in south-eastern India) Das 2002). This species is famed for the 'star-like' radiating patterns of yellow intermixed with black spots on the pyramidal scutes of its shell that serve as camouflage in the wild (Das 1991) (the literal translation of its local name 'nakshatra tabelu' is 'star tortoise'). However, it is this same patterning that also makes it a popular pet to collectors around the world (Fyfe 2007).

The Indian Star Tortoise was last formally assessed in 2000 and is officially considered as Least Concern on the IUCN Red List as it was not thought to be threatened with extinction in any of its range countries (which include India, Pakistan and Sri Lanka (Das 2002)) at that time (Asian Turtle Trade Working Group 2000). However, given that it may become so unless trade is closely controlled, in 1975, it has been included on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (UNEP-WCMC 2011). Consequently, international trade in specimens can take place if an export permit or re-export permit is acquired (CITES 2015). However, to safeguard its wild populations, India had chosen to adopt stricter domestic measures than CITES (WWF 1994). Placed under Schedule IV of the Wildlife (Protection) Act 1972 for over 40 years it has been illegal to possess and commercially trade this species either within or from India (Sekhar 2004).

Despite this legal protection, according to Chng's study (2014) the Indian Star Tortoise was the most frequent illegally traded tortoise seized by Thai authorities between 2008 and 2013 (5966 individuals during 15 cases). Furthermore, this species has also been observed to be the most common openly traded tortoise at the infamous Chatuchak Market in Bangkok, Thailand, during the last decade (653 individuals observed for sale). As a non-indigenous species, it is not currently protected under Thailand's Wild Animal Reservation and Protection Act (WARPA) and enforcement action can only be taken if illegal trade activity is evidenced. However, especially given the possibility of forged trade permits and corruption (TRAFFIC 2008), it can be extremely difficult to identify illegally traded wild sourced individuals and establish the international custody chain once tortoises have been smuggled into the country (Chng 2014). Consequently, there are legitimate concerns that the domestic trade of captive bred Indian Star Tortoises in Thailand represents a 'legal loophole' facilitating illegal poaching from the wild (e.g. Nijman and Shepherd 2015).

Despite increasing concern regarding the illegal international trade in this species, there is a lack of current specific information regarding the number of Indian Star Tortoises obtained via illegal methods, where the traded animals originate from, and the sourcing strategies used to supply them (e.g. Asian Turtle Trade Working Group 2000). To date, there have been four main studies that focussed on the illegal trade in this species from India (Moll 1983, WWF 1994, Sekhar et al. 2004, Anand et al. 2005). One of the most recent peer-reviewed studies conservatively estimated that between 10,000 and 20,000 individuals are being poached from the wild in India each year with authors describing it as 'an erratic localised enterprise' which 'must be contained before it assumes alarming proportions and becomes established' (Sekhar et al. 2004).

Given that the trade in this species was last assessed more than 10 years ago, we conducted fieldwork in India over a 17 month period in order to address the following questions: (1) Where are the current main centres of poaching activity in India? (2) How many tortoises are being (illegally) poached from India each year? (3) What methods are criminal actors using to conduct this illegal trade activity? (4) What are the intended destinations for animals poached from India? We hope that the information gathered will help to guide existing efforts to both preserve remaining wild populations and safeguard the welfare of individual Indian Star Tortoises.

Methods

Illegal trade

To help focus our efforts we collected records of illegal trade from the scientific and grey literature. This semi-systematic review identified the historical occurrence of the illegal trade in 11 (38%) of the 29 states and in one (14%) of the 7 union territory capitals in India over the last 20 years (Figure 1). We identified Andhra Pradesh, Bihar, Delhi, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal as being historically associated with illegal sale and ownership of this species (Moll 1983; Sekhar et al. 2004; Anand et al. 2004; WWF 1994) (Figure 1). We noted that the cities of Bengaluru (also known as Bangalore), Chennai, Delhi, Hyderabad, Kandla, Kolkata, Lucknow, Mumbai, Pune, Thiruvananthapuram and Vadodara are also all specifically mentioned in this regard (e.g. WWF 1994).

We identified the thorn scrub forests located where the borders of the southern Andhra Pradesh, Karnataka and Tamil Nadu states meet as being historically associated with the sourcing of wild Indian Star Tortoises (WWF 1994) (Figure 1). We

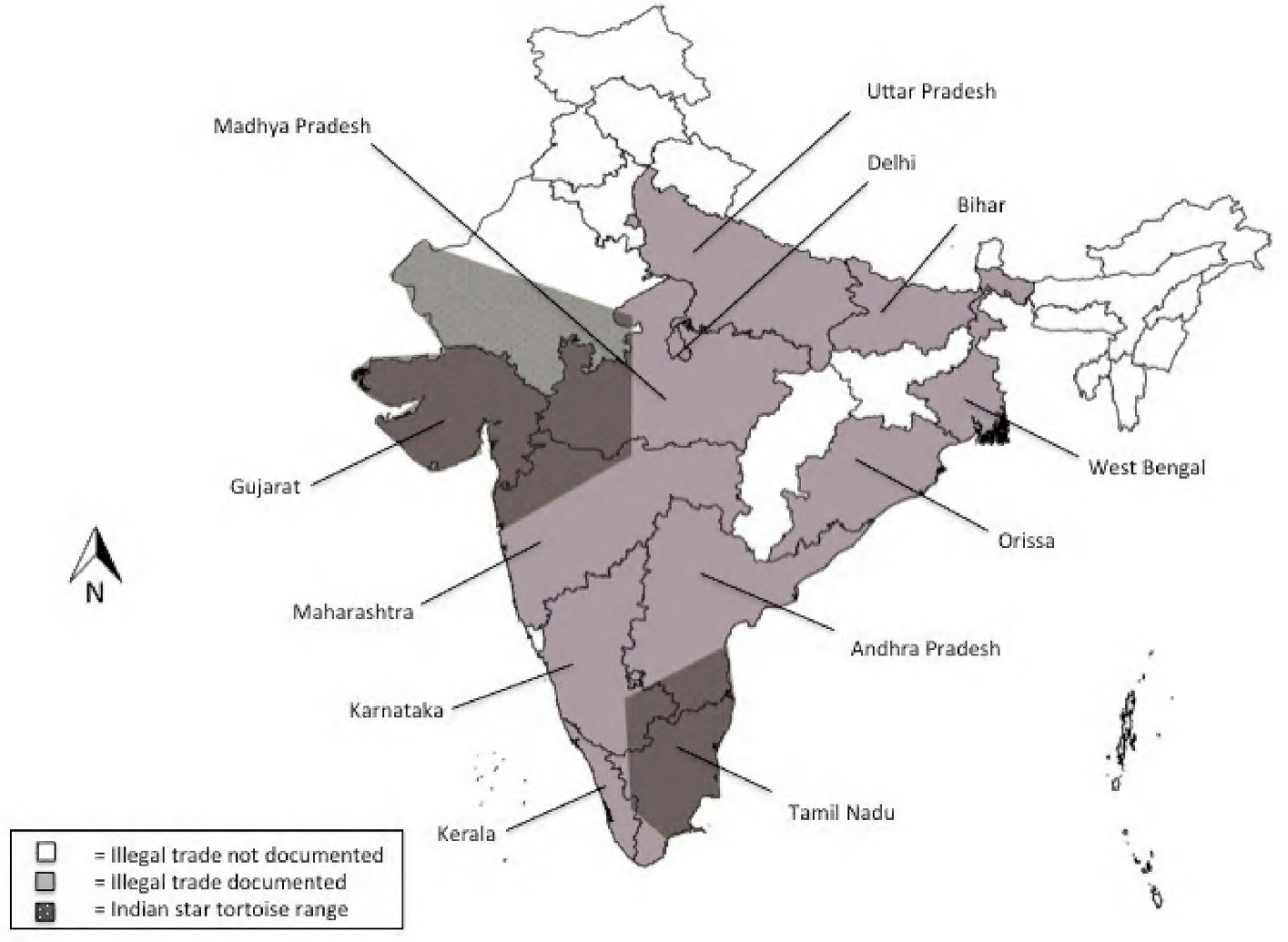

Figure 1. Indian states with documented illegal Indian Star Tortoise trade activity (provided in the existing scientific literature) and the current known geographic distribution of this species within India.

noted that the Saurashtra and Kutch regions of Gujarat are also specifically cited in this regard. We verified this information via concurrent communication with a number of herpetologists and wildlife enforcement officials aware of this issue. Given our specific research objectives (outlined above), we identified the southern state of Andhra Pradesh and the western State of Gujarat as the two sites for our field research.

In Gujarat we focussed our efforts on 16 rural villages and two urban towns surrounding the city of Ahmedabad (referred to hereafter as the 'Gujarat trade hub') (Figure 2). In Andhra Pradesh we focused for US spelling consistency our efforts on eight rural villages around the urban town of Madanapalle, which is located approximately 150 km away from the southern Indian city of Bengaluru, in the state of Karnataka (referred to hereafter as the Andhra Pradesh trade hub) (Figure 2). Between August 2013 and December 2014, we deployed a total of 5 researchers to gather field data. We elicited information, (including footage and stills) from collectors, couriers, consumers and shop retailers regarding source locations (both wild and captive-bred) and intended destinations (both domestic and international). Where possible, researchers documented information regarding the volume and welfare state of the animals involved.

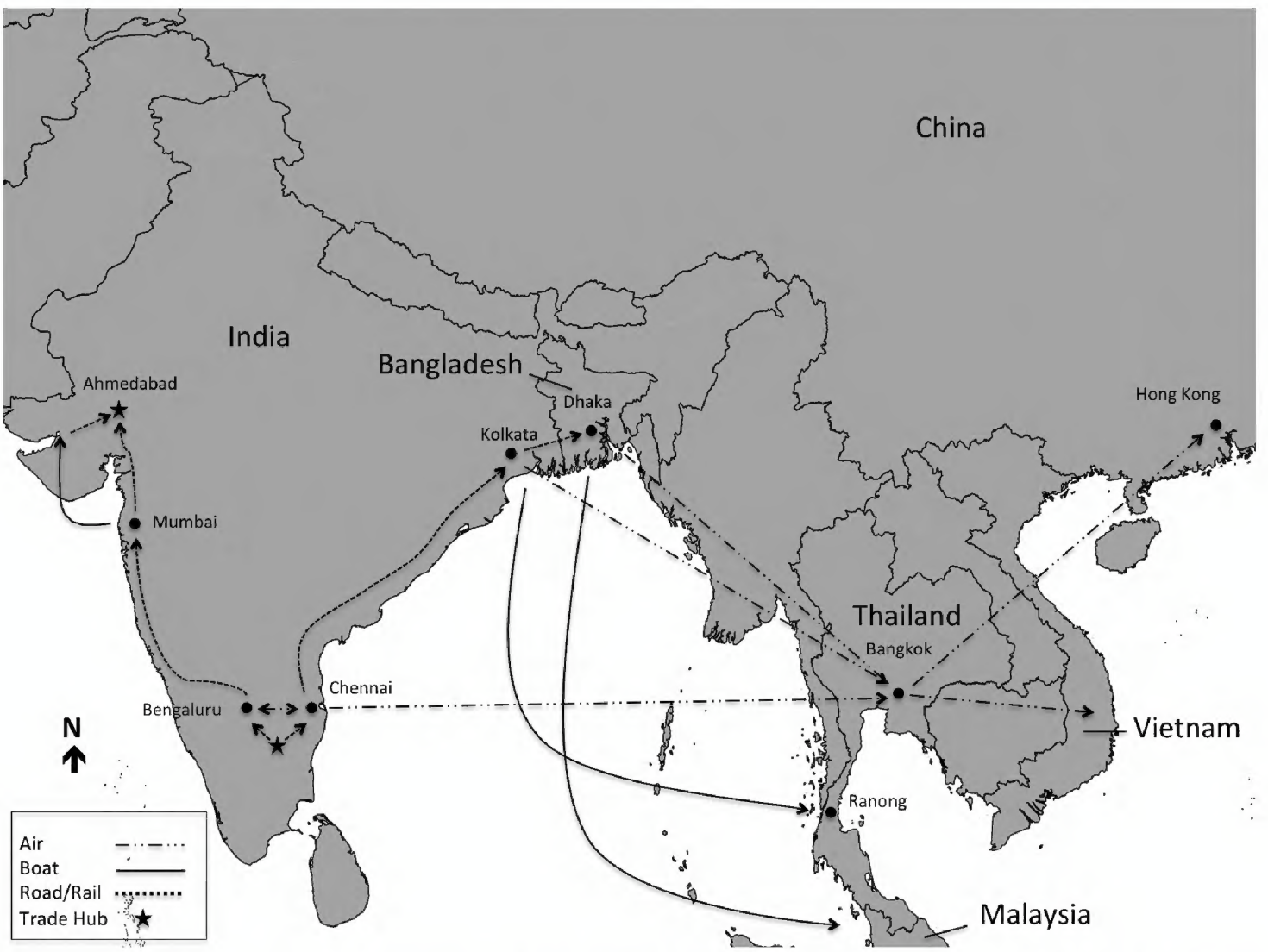

Figure 2. The current domestic and international illegal export trade routes for the Indian Star Tortoise, involving various transport methods (according to this study's fieldwork).

Legal trade

Regulated trade mechanisms can also act as a 'cover' for and facilitate the illegal trade in wild animals (e.g. via false paper work) (TRAFFIC et al. 2008, Dutton et al. 2013). Given existing concerns that 'legal loopholes' are being exploited to sell illegally sourced animals in Thailand (Nijman and Shepherd 2015) we also obtained data from the CITES WCMC (http://trade.cites.org/) to check for any inconsistencies. This database reports all records of import and export of CITES listed species as reported by Parties. Historically there has been some debate amongst taxonomists as to whether this species should be divided into several subspecies or even multiple species (Fife 2007). However, for consistency we included all records referring to '*Geochelone elegans*'. We focus on the live records only, during the period 2004–2013 inclusive, with a specific focus on the numbers reported by both India and Thailand.

Results

Illegal Trade

The Gujarat Trade Hub

With regards to vendors, researchers did not observe any Indian Star Tortoises on open display in this trade hub. However, we found individuals available for purchase upon specific request at the popular 'Dilli Chakla' market in Ahmedabad with seven Indian Star Tortoises (six juveniles and one adult, all in visibly poor health) privately shown to researchers by two vendors during two visits over this period (Figure 2 and Figure 3). Prices ranged from 1,000 to 3,000 Indian rupees (INR) (15 and 50 USD) per animal (Figure 3). Vendors informed researchers that animals sold in Gujarat are typically sourced via contacts based in Bangalore (Figure 2) and are in ready stock in quantities that vary from one to 10. However, larger quantities, if needed, can be supplied with advance payment. They also confirmed that local communities in rural villages surrounding Ahmedabad are also utilised to source wild tortoises from the wild (Figure 2 and Figure 3). The vendors typically operated behind a legitimate facade of dealing in aquariums, exotic birds, and domesticated mammals, such as dogs, cats, rabbits and guinea pigs.

With regards to domestic consumers, despite their legal protection, Indian Star Tortoises are still being openly kept as pets in Gujarat (Figure 4). We observed a total of 107 animals in 17 Hindu households and temples during 36 visits. Owners confirm previous reports (e.g. WWF 1994) that the presence of a tortoise in a household is considered to be a good omen in this particular region of the country. Researchers observed over 100 hatchlings in one urban household on the outskirts of Ahmedabad alone. The owner informed researchers that she was holding these individuals in order to safeguard and prevent their predation prior to subsequent release back into the wild. She was clear to state that, although some were intended for close friends and relatives, none of these animals were intended for commercial sale.

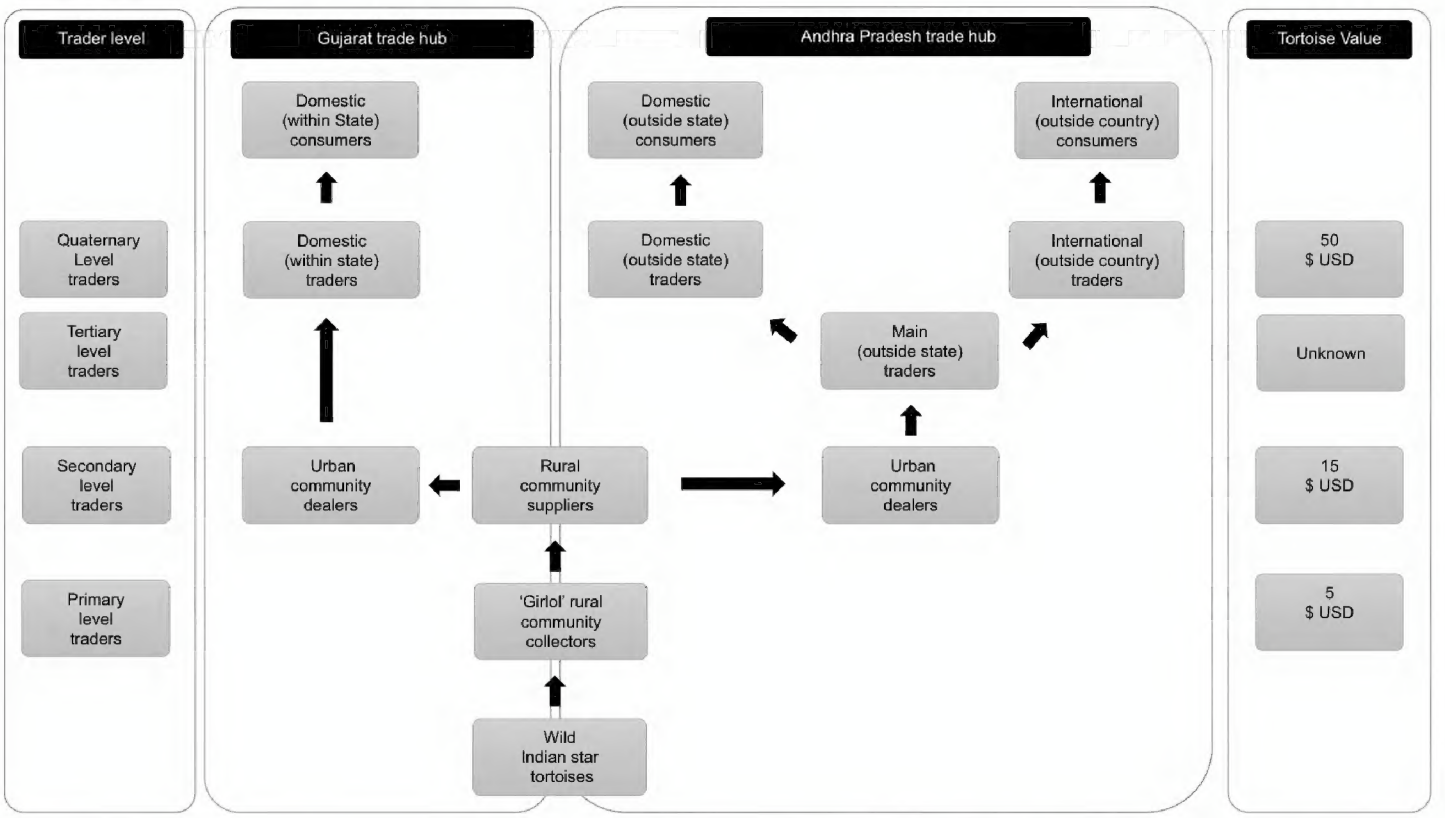

Figure 3. Indian Star Tortoise 'chain of custody' demonstrating the various illegal trade actors and reported market value of individual animals involved in illicit trade activity originating from within India. Tortoise value refers to the maximum observed price (in US dollars) paid to the traders operating at each respective level.

In addition, Indian Star Tortoises are still being openly kept at religious temples for spiritual purposes (Figure 4). We observed a total of 22 animals at three different Shiva temples (with a maximum of 11 individuals observed at one temple) throughout the survey period. We were not permitted access into three additional temples that were reported to house Indian Star Tortoises. Temple representatives confirmed that the tortoise is believed to represent an incarnation of the Hindu God "Vishnu" and as such temple animals are decorated with vermillion marks to symbolize this venerated deity (Figure 4). Animals were reportedly sourced directly from the wild rather than purchased via vendors. Although we were unable to document direct evidence of either the medicinal or subsistence use of Indian Star Tortoises as a source of protein, collectors stated that this activity does still take place.

Previous reports (e.g. WWF 1994) specifically refer to Gujarat as a major organised source of Indian Star Tortoises intended for illegal shipment to the Middle East. However, we found no evidence of any organized illegal transport of Indian Star Tortoises originating from the Gujarat Trade Hub. This is surprising, especially given Gujarat's 1,600 km long coastline, the regular movement of boats to neighbouring Gulf countries, its relatively good transport links (both road and rail) with other large cities in neighbouring states, and the openly observed domestic trade in this species. However, given the relatively short time period of our fieldwork in this geographical area (conducted between August 2013 and January 2014), we acknowledge that further investigation is needed to possibly confirm the absence of illegal transport outside from Gujarat.

Figure 4. A An Indian Star Tortoise at a religious temple near Ahmedabad, Gujarat, India **B** A shopkeeper with a pet Indian Star Tortoise near Ahmedabad, Gujarat, India **C** Indian Star Tortoises kept as pets in a household near Ahmedabad, Gujarat, India **D** An Indian Star Tortoise marked with spiritual 'puja' paint.

The Andhra Pradesh Trade Hub

Unlike Gujarat, in Andhra Pradesh we encountered an organized, large-scale operation engaged in the illegal sourcing of wild Indian Star Tortoises for international consumers (Figure 2, Figure 3). Between January and December 2014 we embedded researchers into a rural hunter-gatherer community known as 'Haki Piki' in Karnataka, 'Yenadi' in Andhra Pradesh and 'Irula' in Tamil Nadu. During this time we observed the collection of at least 55,500 juvenile wild tortoises (a total of 27 consignments, with an average of two per month; Figure 5) by individuals operating from one rural village centre that was collecting tortoises from 15 smaller settlements located along the borders of

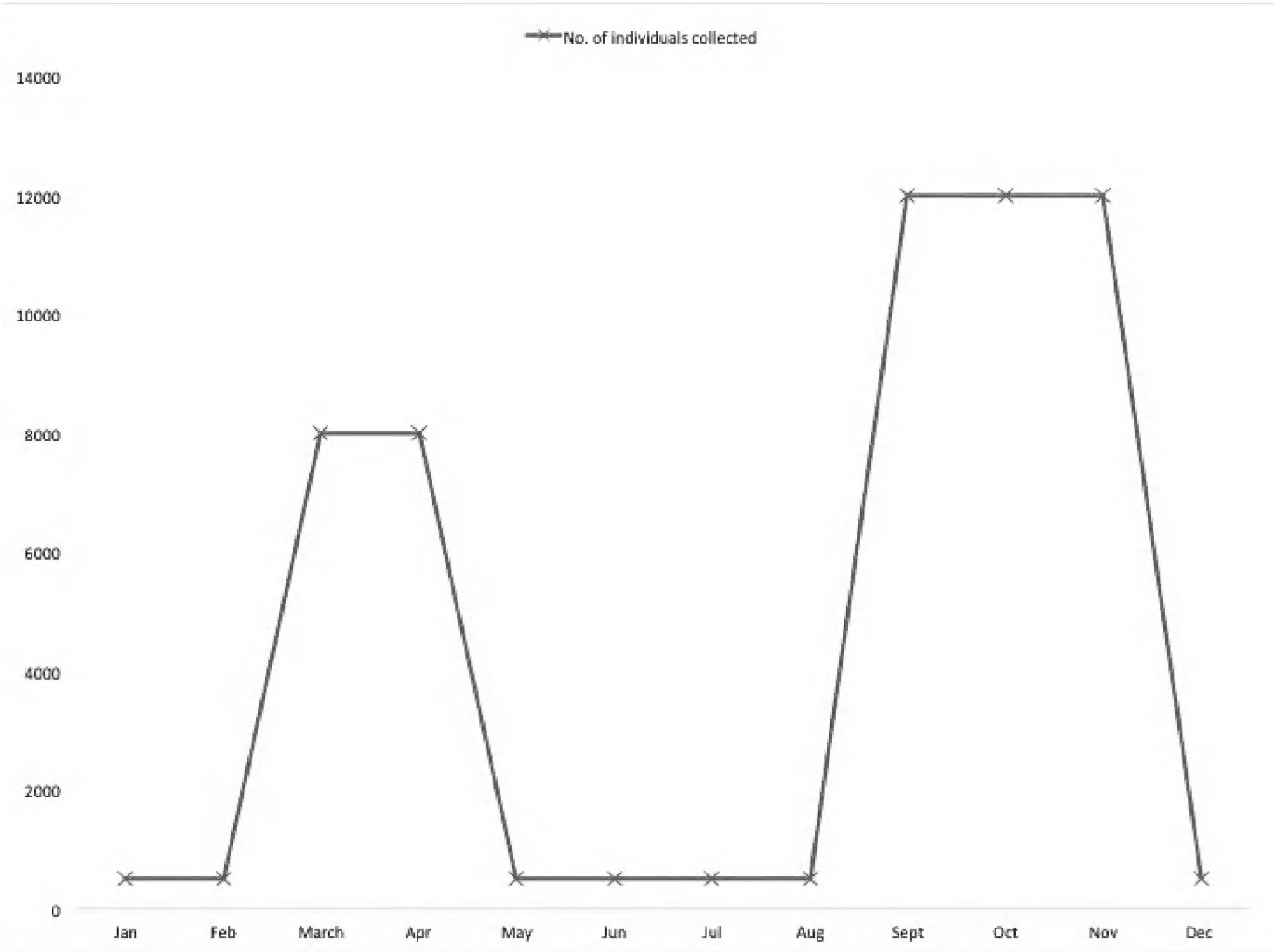

Figure 5. The number of Indian Star Tortoises extracted from one hub 'Madanapalli' in Andhra Pradesh (India) throughout 2014, as observed by this study's field research.

Andhra Pradesh, Karnataka and Tamil Nadu (Figure 2, Figure 6). These secondary level rural traders typically utilize forest dwelling communities like members of the 'Girlol' forest tribal community to collect juvenile tortoises (Figure 3). Collection is predominantly seasonal, taking place after the local monsoon seasons (March and April; and September, October and November) when tortoises tend to emerge out of hiding to feed on fresh sprouting vegetation (Figure 5). Primary collectors tend to pick up specimens that are year-old or older, but collection of sub-adults and adults also takes place.

Between 100 and 150 juvenile tortoises are typically gathered at one time over a period of approximately one week with primary collectors receiving between 50 and 300 Indian Rupees (INR) (1 and 5 USD) per animal from secondary level urban ('middle men') traders depending on the size and health of the animal (Figure 3). Therefore, we conservatively estimate (assuming no mortalities) that the collector engagement in this illegal operation has a collective annual value of up to 16,500,000 INR (263,000 USD) for their impoverished communities. Collectors confirmed they are also often used as couriers to transport these animals to the tertiary level ('main') traders (Figure 3). Animals are often wrapped in cloth and packed into suitcases. However, to avoid detection by enforcement agencies, some are also placed into boxes filled with a top layer 'mask' of other legal produce such as fruit, vegetables, crustaceans and fish.

Figure 6. A: Rural Girlol community collector with wildlife snares; B, C and D; Rural community traders with illegally sourced Indian Star Tortoises (destined for international markets) near Madanapalle, Andhra Pradesh, India.

According to collectors, these tortoises are transported within India to several main traders either by road or by rail (Figure 3, Figure 7). Specifically with regards to this particular trade hub, reference was made to illegal transport along the national highway on the eastern coast of the country joining Chennai (in Tamil Nadu) with Kolkata (in West Bengal) (Figure 7). In addition collectors also made reference to a railway route linking Anantapur and Chittoor (in Andhra Pradesh) to Guwahati (in Assam) via Kolkata (Figure 7). At this stage of the trade chain the main illegal traders are reported to pay between 800 and 1000 INR (12 and 16 USD) per animal (Figure 3). Therefore, we conservatively estimate (assuming no mortalities) that engagement in this operation has an annual value of up to 55,000,000 INR (880,000 USD) for the middlemen involved.

The direct involvement of collectors ends at this point. However, communication with Thai enforcement officials confirmed that cargo boats in Kolkata are used to transport tortoises to other Asian countries including Malaysia, Singapore and Thailand (Figure 7). International passengers also act as couriers taking flights direct from Bengaluru, Chennai, Kolkata and Mumbai (India) or indirect via Dhaka (Bangladesh) into Thailand's Suvarnabhumi International Airport (Anon. Pers. Comm., 2014) (Figure 3 and Figure 7). Alternatively, porous borders are utilised to transport tortoises into Bangladesh (e.g. Dhaka) for further air transport into Thailand (Figure 7). From here, tortoises are also flown on to additional destinations within Southeast Asia including China (predominantly Hong Kong) (Anon. Pers. Comm., 2014) (Figure 7). Throughout our study we found no evidence to suggest that Indian Star Tortoises are being trafficked via Indian from either Sri Lanka or Pakistan.

Legal Trade

Global – CITES Records

Excluding seizure records, CITES reports a total of 211 separate Indian Star Tortoise trade records between 2004 and 2013 (Suppl. material 1). In total, we observed 37,896 individual Indian Star Tortoises reported by export countries during this time. However, during the same time period we also observed a total of 41,014 individual Indian Star Tortoises reported by import countries (representing a discrepancy of 3,118 tortoises). We found that only eleven (5%) of these 211 separate trade transactions have involved wild sourced animals and 198 (94%) of these records have been for commercial use.

India – CITES Records

After analysing the CITES records, we observed no live Indian Star Tortoises (or body parts) exports from India between 2004 and 2013 (Suppl. material 1). During the same time period we found only one import record reported by India (Suppl. material 1). This record relates to 601 wild sourced tortoises that were repatriated following an enforcement seizure made in Malaysia in 2011. These records indicate no legal trade in this species originating from India over the last 10 years.

Thailand – CITES Records

After analysing the CITES records, we observed a total of 2,650 live tortoises imported into Thailand, via seven trade transactions, between 2004 and 2008 (Figure 8; Suppl. material 1). However, we found only 1,100 live individuals reported by exporting countries into Thailand over the same time period (representing a discrepancy of 1,550 tortoises) (Figure 8; Suppl. material 1). We found all of the live imports reported as being sourced via captive breeding programmes for commercial purposes (Suppl. material 1).

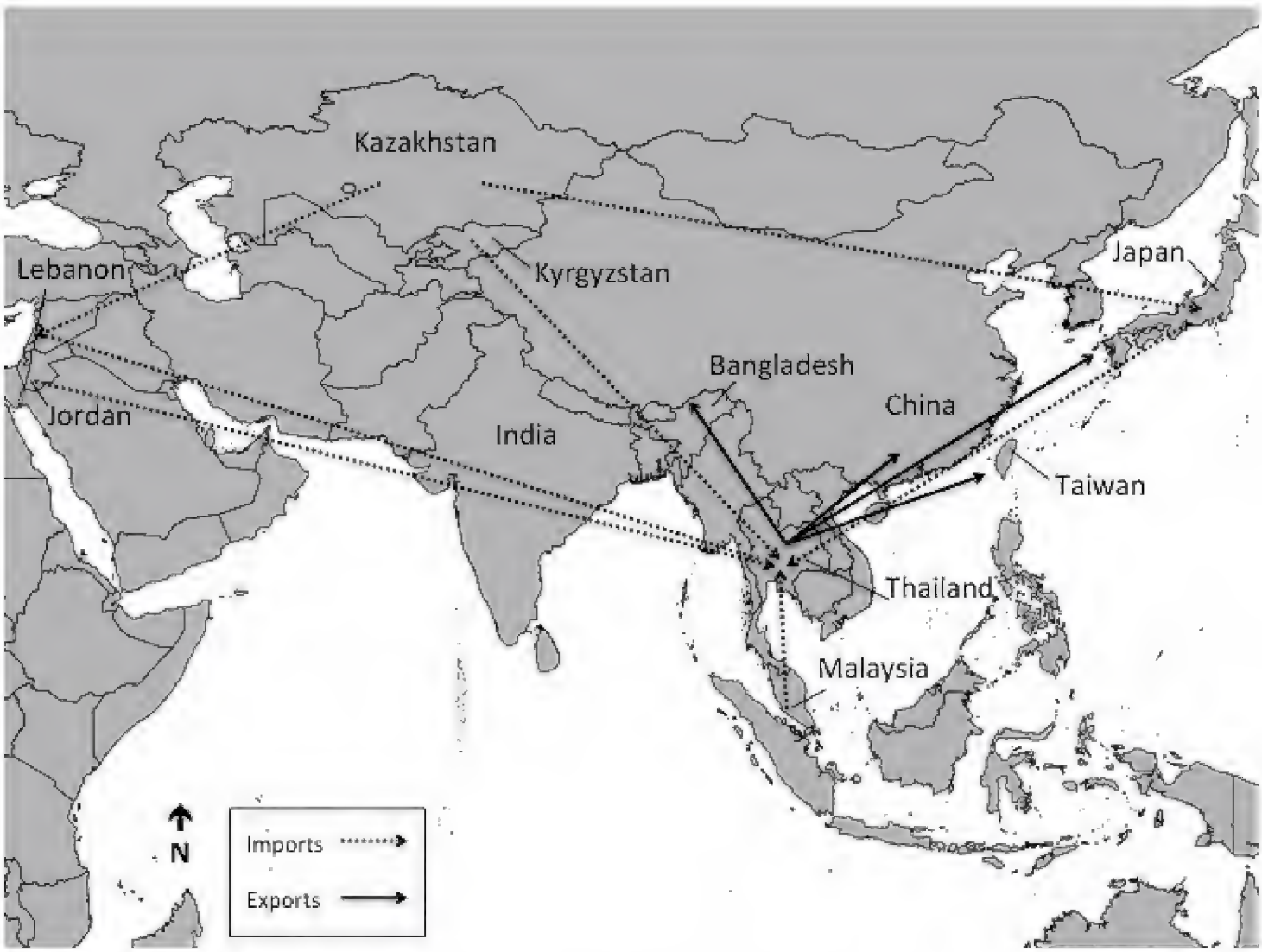

Figure 7. Map to show legal international trade routes for Indian Star Tortoises imported into and exported out from Thailand between 2004 and 2013 (according to CITES WCMC trade database records).

We observed that the majority of import trade transactions into Thailand (43%; n =3) came from Lebanon, although imports also came from Jordan (19%) and Japan (19) (Figure 7). We found that Kazakhstan reported to be the country of origin in all records including such data (57%) (Suppl. material 1). Between 2009 and 2013 only one tortoise was imported into Thailand from Singapore, for personal use, from an unknown source (Figure 7; Suppl. material 1).

Between 2004 and 2008 we observed a total of 540 live tortoises exported from Thailand, via ten trade transactions (Figure 9; and Suppl. material 1). However, we found an additional 960 live individuals reported by importing countries from Thailand over the same time period (representing a discrepancy of 420 tortoises) (Figure 9; and Suppl. material 1). We found all of the live exports reported as being sourced via captive breeding programmes (Suppl. material 1).

We observed that the majority of export trade transactions went to Hong Kong (30%; n = 3) and Japan (30%), although exports also went to Taiwan (20%) and Bangladesh (20%) (Figure 7; and Suppl. material 1). We found Kazakhstan to be most frequently cited as the country of origin (70%) although Lebanon (20%) and Kyrgyzstan (10%) are also cited with Indian Star Tortoises passing through Thailand for an indefinite period of time (Suppl. material 1). Between 2009 and 2013 we found only three Indian Star Tortoises exported from Thailand to Japan for commercial use from a captive bred source (Figure 7; Figure 9 and Suppl. material 1).

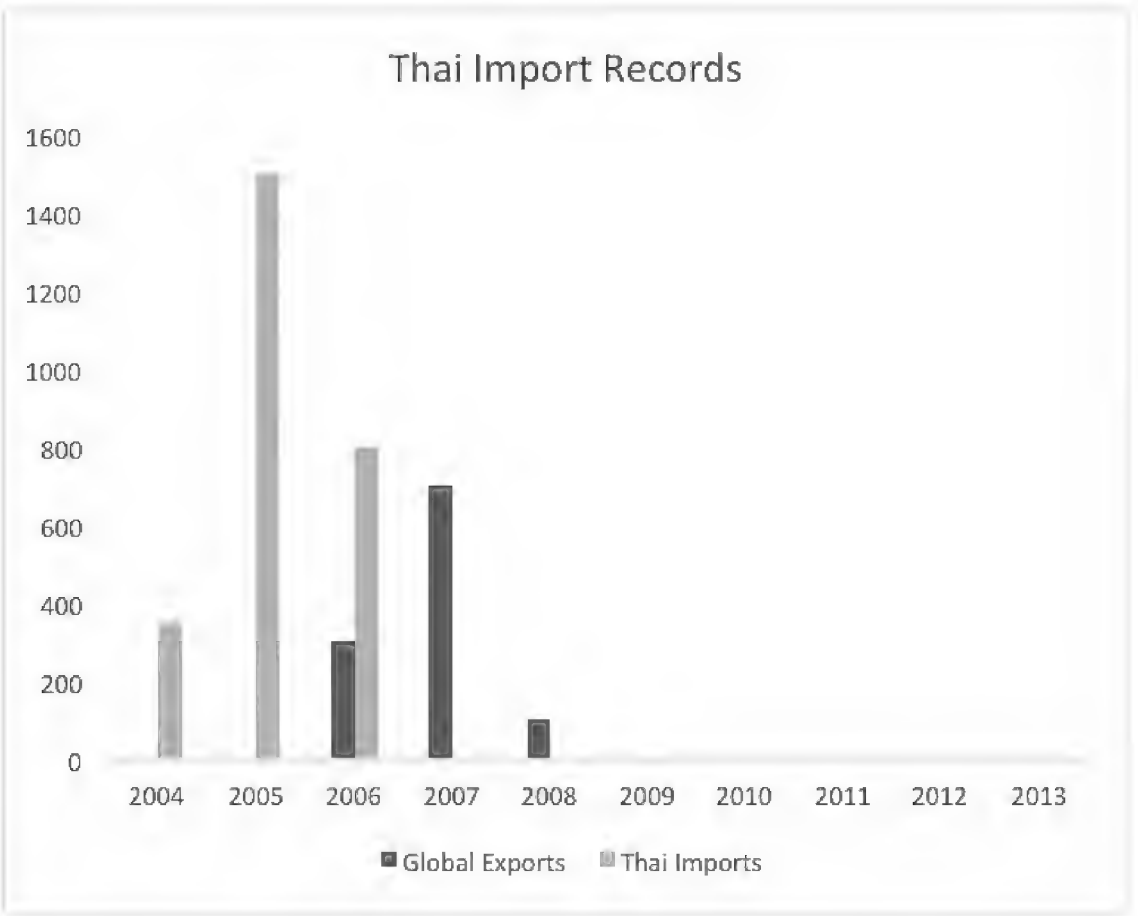

Figure 8. The number of Indian Star Tortoises legally imported into Thailand between 2004 and 2013 according to CITES WCMC trade database records. 'Thai imports' refers to import records reported by Thailand. 'Global exports' refers to export records reported by all other CITES Parties citing Thailand as the intended country of import.

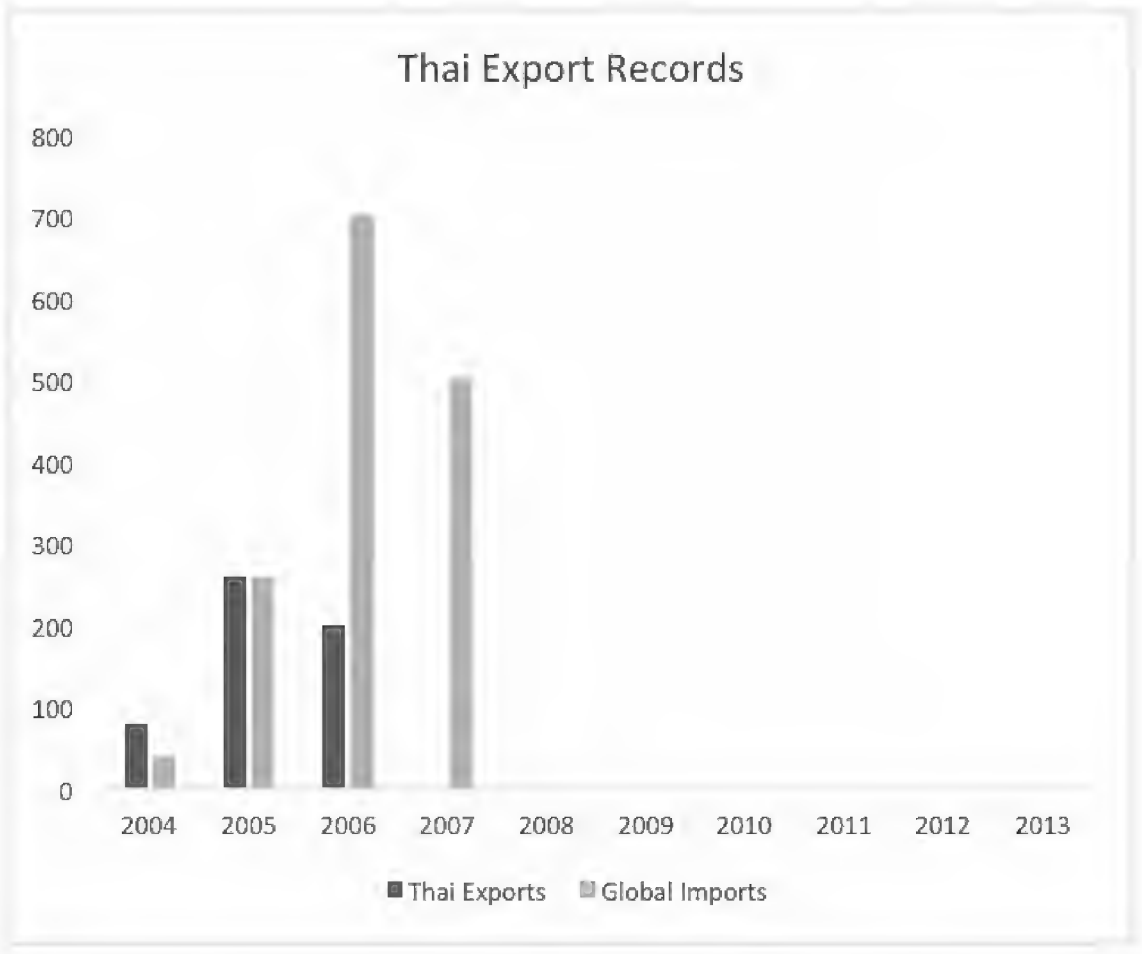

Figure 9. The number of Indian Star Tortoises legally exported out of Thailand between 2004 and 2013 according to CITES WCMC trade database records. 'Thai exports' refers to export records reported by Thailand. 'Global imports' refers to import records reported by all other CITES Parties citing Thailand as the country of export.

Discussion

Conservation and Welfare

The Indian Star Tortoise was last formally assessed for the IUCN Red List fifteen years ago when it was classified as Lower Risk/Least Concern. However, its conservation status is already acknowledged to be in urgent need of updating (Asian Turtle Trade Working Group 2000) and preliminary assessments suggest that a reclassification as 'Vulnerable' may be more appropriate (Horne et al 2012). More detailed field studies regarding the impacts of illegal extraction on wild Indian Star Tortoise populations over time are no doubt required to fully inform this assessment process. However, in cases where there are evident threats to the survival of a species, a threatened listing may be justified even though there may be little direct information on its biological status (IUCN 2015).

We report on the illegal wild removal of at least 55,000 Indian Star Tortoises from just one trade hub in India over a period of one year. This Figure is (three to six times) larger than the 10,000–20,000 individuals previously estimated to be poached throughout the entire range of this species each year (Sekhar et al. 2004). Therefore, despite the current wide distribution of the Indian Star Tortoise, it may be wise to adopt a more precautionary approach to the conservation of this species by providing it with a threatened category status until such detailed information becomes available.

This illegal trade also represents an on-going animal welfare threat (Sekhar et al. 2004, Anand et al. 2005). Physical injury and stress associated with illegal capture, handling and overcrowding can lead to disease and death of traded animals (Warwick 1990; Baker et al. 2013). However, new research also continues to demonstrate that the stress associated with captive conditions during private ownership can also cause detrimental behavioural changes, such as hyperactivity, lethargy and anorexia (e.g. Arena et al. 2012).

Previous studies have raised concerns that Indian Star Tortoises are being smuggled from India into pet markets in Asia, Europe and the United States (e.g. Horne et al. 2012) Although more detailed information is required regarding the consumers involved in this illegal trade chain, our study suggests that many of the Indian Star Tortoises being illegally traded from the Andhra Pradesh trade hub in India appear to be destined for use as exotic pets in Asian countries, such as Thailand and China. As such there are concerns that even if these animals survive capture and illegal transport their welfare may still be compromised as it is currently unclear whether vendors and consumers in these countries possess even a basic understanding of Indian Star Tortoise husbandry requirements (Sekhar et al. 2004, Anand et al. 2005).

An Organized Criminal Network

Ownership of Indian Star Tortoises is likely to have been a long held cultural practice in India (WWF 1994). However, the international commercial trade in this species

appears to be a relatively new and rapidly increasing phenomenon. During an initial survey, Moll (1983) found no evidence of Indian Star Tortoise trade at any of the wildlife markets visited throughout the country and it was not until the mid-1990's (WWF 1994) that initial conservation concerns regarding this illegal activity were first raised. In Gujarat, our findings confirm those of Sekhar et al. (2004) who described an "erratic localised enterprise". Although, commercial trade is clearly taking place, we found no evidence of organised international criminal involvement at this particular trade hub.

Unfortunately, our findings did confirm that the commercial trade in this species has evolved into an international organised criminal operation in other parts of the country (e.g. the Andhra Pradesh trade hub). This type of illegal activity involves a wide range of actors ranging from the rural poor to wealthy urban entrepreneurs (TRAFFIC 2008). It appears that 'middlemen' have built upon the methods to disguise consignments that were first documented more than 10 years ago (Sekhar et al. 2004) to smuggle tortoises internationally via road, rail, air and sea. Even when liberal mortality rates are taken into account, this represents a lucrative business venture worth hundreds of thousands of USD each year to the main criminal actors involved.

Legal Loopholes

Our analysis of CITES records also raises some concerns regarding the current legal trade in this species. We found large discrepancies between imports and exports relating to Thailand that are widely recognized indicators of illegal activity. Historically, Kazakhstan is reported to have been the main supplier into Thailand despite the fact that it is not a range country for this species and a complete lack of import records for any captive breeding stock (Suppl. material 1). The significant involvement of Lebanon (a non-CITES Party until 2013) also calls the legitimacy of Thailand's founding stock into question. Previous calls for CITES Management Authorities to investigate this particular trade route (e.g. Nijman and Shepherd 2010) may be partly responsible for the observed lack of Indian Star Tortoise imports into Thailand over the last five years.

India's Wildlife Protection Act prohibits both trade and private ownership of this species. However, legal domestic trade in other Asian countries appears to be undermining India's efforts to protect this species (Nijman and Shepherd 2015). Specifically, now that the illegal laundering of wild caught animals via legal pathways is subject to increased scrutiny, it appears that illegal reptile traders are increasingly using other more clandestine methods to smuggle these animals into Thailand and on to other target consumer countries, such as China. Once they enter countries that permit legal trade in this species, it is very difficult for the relevant enforcement agencies to distinguish between wild caught and captive bred animals (Nijman and Shepherd 2010).

Consumer demand

With regards to consumers, our study reveals that within India some demand undoubtedly persists for subsistence purposes among members of the rural poor (i.e. as a source of protein). However, on wider assessment, wealth also appears to be an equally strong (if not stronger) driver as domestic demand also extends to 'luxury' use as exotic pets and spiritual purposes. Similarly, although more research is required, international demand for this species throughout South East Asia (particularly Thailand and China) also appears to be driven by demand for use as exotic pets stimulated by increasing affluence across this region (Nijman and Shepherd 2015).

Recommendations

Given the scale of the illegal trade in Indian Star Tortoises uncovered during our study, we recommend that more detailed research should be carried out in order to establish the impact that this unregulated activity is having on wild populations. This information will be required in order to make a fully informed updated formal assessment of the IUCN Red List status of this species. However, while this information is being collected, we suggest that assessors use existing information to inform whether a precautionary approach to the listing of the Indian Star Tortoise is required to help safeguard its survival.

Working together, national enforcement agencies can detect and disrupt the trafficking of wildlife by organised criminal groups, for example by documenting illegal business activities and identifying laws that have been broken in each other's jurisdictions (TRAFFIC 2008). Given the relatively recent development of a highly organised international criminal trade network (involving India, Thailand and other Asian countries such as China) we recommend increased cooperation between relevant national enforcement bodies in collaboration with the Association of Southeast Asian Nations' Wildlife Enforcement Network (ASEAN-WEN).

The legal trade in other Asian countries also appears to be undermining India's efforts to protect the Indian Star Tortoise. As such, we support existing calls (e.g. Nijman and Shepherd 2015) for these 'sink' countries to implement corresponding national bans regarding the commercial trade in this species. In particular, given its concerning current role as a country of transit, extending WARPA to protect non-indigenous species could help to aid Thailand's existing enforcement efforts to address this illegal trade activity.

It is important to note, wildlife laws and enforcement efforts stand little chance of success unless consumer demand for protected wildlife is also addressed (TRAFFIC 2008). Consequently, we recommend that further studies should be carried out to acquire a more detailed understanding of the attitudes and behaviours of Indian Star Tortoise consumers. This information will help to inform existing and any future human behaviour change initiatives focussed on reducing consumer demand for this protected species.

Evidence suggests that a multifaceted approach can be successful in reducing illegal trade in Indian Star Tortoises. For example, a recent market survey has indicated a dramatic drop in the number of Indian Star Tortoises in Malaysian shops over the last 10 years as a direct result of new wildlife legislation, increased enforcement effort and targeted public awareness initiatives (Chng and Bouhuys 2015). As such this type of approach has the potential to yield similar results in other countries of Indian Star Tortoise trade concern such as Thailand.

Acknowledgements

We thank BC Choudhary, Margaret Balaskas, Kate Nustedt, Simon Pope, Gajender Sharma, Emily Reeves, Lyndall Stein, and Peter Paul van Dijk for their invaluable comments and insights during this research project. Many thanks to the Investigation and Intelligence Team at World Animal Protection, and anonymous contributors, who provided confidential information in support of this research. Special thanks go to Steve McIvor for supporting this project. This research project was fully funded by World Animal Protection.

References

Anand VD, Moses A, Varma S (2005) The Fading Star – An investigation into the illegal trade in Indian Star Tortoise in south India. A Rocha India, Bangalore, and Wildlife Trust of India, New Delhi, 1–26.

Arena PC, Warwick C, Steedman C (2014) Welfare and environmental implications of farmed sea turtles. Journal of Agricultural and Environmental Ethics 27: 309–330.

Asian Turtle Trade Working Group (2000) *Geochelone elegans*. The IUCN Red List of Threatened Species. http://www.iucnredlist.org/details/39430/0

Baker S, Cain R, Kesteren F, Zommers Z, D'Cruze N, Macdonald D (2013) Rough trade: animal welfare in the global wildlife trade. BioScience 63: 28–938.

Bangkok Post (2014) First animal welfare law passed. http://www.bangkokpost.com/news/general/442966/first-animal-welfare-law-passed

Bush ER, Baker SE, Macdonald DW (2014) Global trade in exotic pets 2006–2012. Conservation Biology 28: 663–676.

Chng SCL (2014) Seizures of tortoises and freshwater turtles in Thailand 2008–2013. TRAFFIC, Petaling Jaya, 1–24.

Chng SCL, Bouhuys J (2015) Indian Star Tortoises: Shop sales fall as internet trade increases. TRAFFIC Bulletin 27: 73–78.

CITES (2015) Convention text. http://www.cites.org/eng/disc/text.php

Das I (1991) Colour guide to the turtles and tortoises of the Indian subcontinent. R&A Publishing Ltd., Portishead, 133 pp.

Das I (2002) A photographic guide to snakes and other reptiles of India. New Holland Publishers, London, 144 pp.

Dutton AJ, Gratwicke B, Hepburn C, Herrera EA, Wunder S (2013) Tackling unsustainable wildlife trade. In: Macdonald DW, Willis KJ (Eds) Key topics in conservation biology. Wiley-Blackwell, 74–92.

Fyfe JD (2007) Star tortoises: The natural history, captive care and breeding. Turtles of the world series, Number 10. Jerry D. Fyfe and Living Art Publishing, 116 pp.

Horne BD, Poole CM, Walde AD (2012) Conservation of Asian tortoises and freshwater turtles: Setting priorities for the next ten years. Recommendations and conclusions from the workshop in Singapore, February 21–24, 2011.

INTERPOL (2010) Co-ordinated operation targeting illegal trade in endangered reptiles leads to arrests and seizures worldwide. http://www.interpol.int/News-and-media/News/2010/PR089

IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (2010) Implementation of Decision 14.128: A study of progress on conservation of and trade in CITES-listed tortoises and freshwater turtles in Asia. SC61 Doc. 47 (Rev. 2) Annex 2.

Lawson K, Vines A (2014) Global Impact of the Illegal Wildlife Trade – The Costs of Crime, Insecurity and Institutional Erosion. Chatham House, London, 62 pp.

Moll EO (1983) Turtle survey update (January to April 1983). Hamadryad 8: 15–17.

Nijman V, Shepherd CR (2010) The role of Asia in the global trade in CITES II-listed poison arrow frogs: hopping from Kazakhstan to Lebanon to Thailand and beyond. Biodiversity and Conservation 19: 1963–1970.

Nijman V, Shepherd CR, Mumpuni, Saunders KL (2012) Over-exploitation and illegal trade of reptiles in Indonesia. Herpetological Journal 22: 83–89.

Nijman V, Shepherd CR (2015) Analysis of a decade of trade of tortoises and freshwater turtles in Bangkok, Thailand. Biological Conservation 24: 309–318.

Robinson JE, Griffiths RA, John FAVS, Roberts DL (2015) Dynamics of the global trade in live reptiles: Shifting trends in production and consequences for sustainability. Biological Conservation 184: 42–50.

Shepherd CR, Burgess EA, Loo M (2004) Demand driven: The trade of Indian Star Tortoises *Geochelone elegans* in Peninsular Malaysia. TRAFFIC Southeast Asia, Petaling Jaya, 1–18.

Sekhar AC, Gurunathan N, Anandhan G (2004) Star tortoise: A victim of the exotic pet trade. Tigerpaper 31: 4–6.

TRAFFIC (2008) What's driving the wildlife trade? A review of expert opinion on economic and social drivers of the wildlife trade and trade control efforts in Cambodia, Indonesia, Lao PDR and Vietnam. East Asia and Pacific region sustainable development discussion papers. East Asia and Pacific Region Sustainable Development Department, World Bank, Washington, 1–133.

TRAFFIC (2013) Overview of important international seizures of CITES-listed specimens in the European Union – January to December 2012. TRAFFIC briefing for the European Commission. TRAFFIC, Cambridge, 1–8.

UNEP-WCMC (2011) Checklist of CITES species (CD-ROM). CITES Secretariat, Geneva, and UNEP-WCMC, Cambridge, 114–115.

UNEP-WCMC (2014) CITES source codes: Review of CITES Annual Report data for specimens recorded using source codes C, D, F and R. UNEP-WCMC, Cambridge, 23–25.

van Dijk PP, Palasuwan T (2000) Conservation status, trade, and management of tortoises and freshwater turtles in Thailand. In: van Dijk PP, Stuart BL, Rhodin AGJ (Eds) Proceedings of a workshop on conservation and trade of freshwater turtles and tortoises in Asia, Chelonian. Research Monographs 2, Phnom Penh, 137–144.

Warwick C (1990) Reptilian ethology in captivity: observations of some problems and an evaluation of their aetiology. Applied Animal Behaviour Science 26: 1–13.

WWF (1994) Turtle trade in India: A study of tortoises and freshwater turtles. WWF, New Delhi, 1–50.

Supplementary material I

Table S1. Table of the Indian Star Tortoise trade transactions (1975–2013)

Authors: Neil D'Cruze, Bhagat Singh, Thomas Morrison, Jan Schmidt-Burbach, David W. Macdonald, Aniruddha Mookerjee

Data type: trade transactions data

Explanation note: Table to show the Indian Star Tortoise trade transactions (1975-2013) as recorded by the Convention on International Trade in Endangered Species of Wild Fauna and Flora World Conservation Monitoring Centre (CITES WCMC) database (http://trade.cites.org/).

Copyright notice: This dataset is made available under the Open Database License (http://opendatacommons.org/licenses/odbl/1.0/). The Open Database License (ODbL) is a license agreement intended to allow users to freely share, modify, and use this Dataset while maintaining this same freedom for others, provided that the original source and author(s) are credited.